

REMARKS

In the last Office Action, claims 1, 120, 121, 127 and 128 were rejected under 35 U.S.C. §102(b) as being anticipated by Brezoczky (EPA 0-549-236 A2). Claims 2-14, 101, 103, 104, 122-126, 129 and 130 were rejected under 35 U.S.C. §103(a) as being unpatentable over Brezoczky. Additional art was cited of interest.

In accordance with the present response, independent claims 11, 12 and 14 have been amended to incorporate the subject matter of claims 123, 124 and 126, respectively, which have been canceled.

Applicants respectfully traverse the Section 102, 103 rejections of claims 2-14, 101, 103, 104, 120-122, 125, and 127-130 and request reconsideration of their application in light of the foregoing amendments and the following discussion.

The present invention relates to a near-field optical head and to a method of manufacturing the near-field optical head.

As described in the specification (pgs. 1-7), conventional near-field optical heads have been unable to produce sufficient near-field light for recording information to and reading-out information from a recording medium with high speed, accuracy and efficiency. Additionally, conventional near-field optical heads have a rather large and

complicated structure, thereby rendering them difficult to operate.

The present invention overcomes the drawbacks of the conventional art. Figs. 6A-6B show a method of manufacturing a near-field optical head 500 shown in Fig. 5 and embodied in independent claim 11. A planar substrate 501 is provided having a first surface and a second surface opposite the first surface. An inverted conical or pyramidal hole 507 having a fine aperture at an apex thereof is formed through the first surface of the planar substrate 501 (S101). An optical waveguide 504 is formed directly on the second surface of the planar substrate for propagating light along an optical path (S102-104). A mirror 508 is formed in the optical waveguide 504 for bending in the direction of the fine aperture the optical path of the light propagated through the optical waveguide 504 (S105-S016).

In other examples embodied in independent claims 12 and 14, the optical waveguide is directly bonded on the second surface of the planar substrate for propagating light along an optical path.

In yet another example embodied in independent claim 127, the optical waveguide is formed on the second surface of the planar substrate so that the optical waveguide and the planar substrate form an integral structure.

By the foregoing construction of the near-field optical head and corresponding manufacturing method according to the present invention, the optical waveguide can be arranged close to the fine aperture (i.e., by forming or bonding the optical waveguide directly on the second surface of the planar substrate or by forming the optical waveguide on the second surface of the planar substrate so that the optical waveguide and the planar substrate form an integral structure). Additionally, the mirror and its location in the optical waveguide makes it possible to accurately focus the light propagated through the optical waveguide toward the fine aperture. Accordingly, the strength of light illuminated to the fine aperture and the intensity of near-field light produced from the fine aperture are increased as compared to the conventional art. Furthermore, the near-field optical head according to the present invention has high mechanical strength, a compact structure, and can be easily mass-produced.

Rejection Under 35 U.S.C. §102(b)

Claims 1, 120, 121, 127 and 128 were rejected under 35 U.S.C. §102(b) as being anticipated by Brezoczky. A rejection for anticipation under 35 U.S.C §102 requires that each and every limitation of the claimed invention be disclosed in a single prior art reference. In addition, the reference must be enabling and describe the applicants'

claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. In re Paulsen, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994); In re Spada, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990). An anticipating reference must describe all of the elements and limitations of the claim in a single reference, and enable one of skill in the field of the invention to make and use the claimed invention. Merck & Co. v. Teva Pharm. USA Inc., 68 USPQ2d 1857, 1861 (Fed. Cir. 2003). Applying this law, Brezoczky clearly does not anticipate claims 1, 120, 121, 127 and 128.

Independent Claim 1

Independent claim 1 is directed to a near-field optical head and recites an optical waveguide disposed directly on the second surface of the planar substrate for propagating light along an optical path. No corresponding structure is disclosed or described by Brezoczky.

Brezoczky discloses an optical head comprising a planar substrate (i.e., slider) 31 (Fig. 3) or 51 (Figs. 4-5) having a conical hole 35 with a fine aperture 37 (col. 6, lines 1-22), and an optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig. 5) from which the planar substrate or slider is suspended by a flexure spring suspension 63 (col. 7, lines 43-53).

Thus in Brezoczky, the optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig.

5) is not disposed "directly" on a surface of the planar substrate (i.e., slider 31 in Fig. 3 or 51 in Figs. 4-5), as recited in claim 1. Instead, in Brezoczky the optical waveguide is connected to the planar substrate via a flexure spring suspension denoted by reference numeral 63 in Fig. 5. In this regard, the flexure spring 63 does not form part of the optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig. 5), but is instead a separate and independent component which functions to impose an appropriate force onto the head toward the disk surface (col. 7, lines 12-14).

Independent Claim 127

Independent claim 127 is directed to a near-field optical head and requires an optical waveguide for propagating light along an optical path, the optical waveguide being formed on the second surface of the planar substrate so that the optical waveguide and the planar substrate form an integral structure. No corresponding structure is disclosed or described by Brezoczky.

As noted above, the optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig. 5) in Brezoczky is suspended from the planar substrate 31 via a flexure spring suspension 63. Thus in Brezoczky, the optical waveguide is not "formed" on a surface of the planar substrate, and further so that the planar substrate and the

optical waveguide form "an integral structure", as recited in claim 127. Again, in Brezoczky the optical waveguide is suspended relative to the planar substrate via a flexure spring suspension.

Therefore, Brezoczky cannot anticipate independent claims 1 and 127. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), citing Jamesbury Corp. v. Litton Industrial Products Inc., 225 USPQ 253, 256 (Fed. Cir. 1985) (The identical invention must be shown in as complete detail in the reference as contained in the claim.) Furthermore, Brezoczky does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Brezoczky's optical head to arrive at the claimed invention.

Dependent Claims 120, 121, 128

Claims 120-121 and 128 depend on and contain all of the limitations of independent claims 1 and 127, respectively, and, therefore, distinguish from the prior art of record at least in the same manner as claim 128.

Moreover, there are separate grounds for patentability of dependent claims 120-121 and 128.

Claim 120 includes the additional limitation that the optical waveguide is integrally connected to the second surface of the planar substrate. No corresponding structure

is disclosed or suggested by Brezoczky as set forth above for independent claim 127.

Claims 121 and 128 include the additional limitation that the near-field optical head is an air floating-type optical head. With respect to this structure, the Examiner contends that Brezoczky discloses an air floating head. Applicants respectfully disagree with the Examiner's contention.

Brezoczky explicitly discloses that the optical head is a "contact" type optical head, not an air floating-type optical head. See, for example: abstract at line 14; col. 2, lines 37-42; col. 3, lines 12, 22, 30; col. 4, lines 18, 46, 58; col. 5, lines 4-58; col. 6, lines 4, 42, 48; col. 7, line 25; col. 8, lines 8, 16; col. 9, line 1; claim 1; and claim 20. While the abstract (line 19) refers to an "air layer", such "air layer" refers to air flow around the head, rather than air between the head and the disk. Brezoczky does not address at all an air floating-type optical head, as recited in claims 121 and 128.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 120, 121, 127 and 128 under 35 U.S.C. §102(b) as being anticipated by Brezoczky be withdrawn.

Rejection Under 35 U.S.C. §103(a)

Claims 2-14, 101, 103, 104, 122, 125, 129 and 130 were rejected under 35 U.S.C. §103(a) as being unpatentable over Brezoczky. Applicants respectfully traverse this rejection.

Independent Claim 13

Independent claim 13 is directed to a method for manufacturing a near-field optical head and requires disposing an optical waveguide directly on the second surface of the planar substrate for propagating light along an optical path. Brezoczky does not disclose or suggest an optical waveguide disposed directly on a surface of a planar substrate, as set forth above for independent claim 1.

Independent Claims 11, 12 and 14

Independent claims 11, 12 and 14 have been amended to incorporate the subject matter of claims 123, 124 and 126, respectively. As amended, independent claim 11 recites forming an optical waveguide directly on the second surface of the planar substrate. As amended, each of independent claims 12 and 14 recites bonding the optical waveguide directly on the second surface of the planar substrate. No corresponding steps are disclosed or suggested by Brezoczky.

In Brezoczky, the optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig. 5) is neither "formed" nor "bonded" on a surface of the planar substrate (i.e., slider 31 in Fig. 3 or 51 in Figs. 4-5). Instead, in Brezoczky the optical waveguide is connected to the planar substrate via a flexure spring suspension 63, as set forth above for independent claims 1 and 127.

Recognizing the foregoing deficiency in Brezoczky, the Examiner contends that the steps of "forming" and "bonding" are well known in the art of manufacturing optical heads as forms of connection or coupling techniques between elements. In view of this, the Examiner concludes that it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to connect the optical waveguide to the planar substrate in Brezoczky by "forming" or "bonding" the optical waveguide on a second surface of the substrate instead of using the flexure spring suspension. Applicants vigorously disagree with the Examiner's contention and conclusion of obviousness.

In order to support a claim rejection based upon obviousness under 35 U.S.C. §103, the Examiner must provide an evidentiary basis establishing the obviousness of each modification. The Examiner may do this by citing a reference which directly establishes this obviousness, or, the Examiner may otherwise set forth a line of reasoning consistent with

and motivated by the cited art establishing that such modifications would have been obvious. Mere speculation or conclusory allegations are simply inadequate to meet this burden. There must be some teaching, reason, suggestion, or motivation found in the prior art references to make a combination which renders an invention obvious within the meaning of 35 U.S.C §103. See, e.g., Symbol Technologies, Inc. v. Opticon, Inc., 935 F.2d 982, 989, 18 USPQ2d 1885 (Fed. Cir. 1991).

In order to set forth a prima facie case of obviousness, the Examiner must not only demonstrate that this teaching exists in the prior art, but that it would teach all limitations of the claim. Stated otherwise, in rejecting a claim as obvious under 35 U.S.C. §103, the Examiner cannot simply rely on a reference that teaches some limitations of the claim, and make mere conclusory allegations that the combination teaches others as well. In the instant case, the Examiner has not met his burden of establishing a prima facie case of obviousness with respect to the specific "forming" and "bonding" steps recited in claims 11, 12 and 14.

For example, claim 11 recites the step of "forming an optical waveguide directly on the second surface of the planar substrate." Claim 12 recites the step of "bonding an optical waveguide directly on the second surface of the planar substrate." As set forth above, in Brezoczky the optical

waveguide is connected to the planar substrate via a flexure spring suspension. Brezoczky does not teach any other form of connection between the optical waveguide and the surface of the planar substrate. In this regard, following the Examiner's conclusion of obviousness, what procedure would be followed in Brezoczky so as to "form" or "bond" the optical waveguide on the surface of the planar substrate? Even if it were possible to make such modifications in Brezoczky, the Examiner has not cited any reference which directly establishes the obviousness of such modification, nor has the Examiner set forth a line of reasoning consistent with and motivated by the cited art establishing that such modifications would have been obvious.

Moreover, as amended, each of independent claims claims 12 and 14 now recites bonding the optical waveguide directly on the second surface of the planar substrate. Brezoczky does not disclose or suggest such "direct" form of connection between the optical waveguide and the surface of the substrate. Again, the only form of connection between the optical waveguide and the surface of the planar substrate in Brezoczky is via a flexure spring suspension 63, as set forth above for independent claims 1 and 127.

Independent Claims 101, 103, 104

Independent method claims 101, 103 and 104 also recite combinations of steps which are not disclosed or suggested by Brezoczky. For example, claim 101 recites a combination of steps which requires the specific manner of forming a light propagation member, a light introducing part, and a light reflection layer. Claims 103 and 104 recite the combination of steps which require the specific manner of forming a tapered hole, disposing a metal film, forming a convex surface portion, and bonding a light introducing part. The Examiner has failed to specifically address these limitations in the rejection of claims 101, 103 and 104.

Should the Examiner continue to rely on the reference to Brezoczky in any manner to reject any of claims 101, 103 and 104, applicants respectfully request that the Examiner specify the teachings in Brezoczky being relied upon and how the Examiner proposes to modify Brezoczky to arrive at the invention recited in claims 101, 103 and 104.

Dependent Claims 2-9, 122, 125, 129 and 130

Claims 2-9, 122 and 125 and 129-130 depend on and contain all of the limitations of independent claims 1, 13 and 127, respectively, and, therefore, distinguish from Brezoczky at least in the same manner as claims 1, 13 and 127.

Moreover, there are separate grounds for patentability of several of the dependent claims.

Claims 2 and 130 include the additional limitation that the optical waveguide extends into the inverted conical or pyramidal hole. With respect to these claims, the Examiner contends that it would have been obvious to form the optical waveguide (i.e., element denoted by reference numerals 46, 49, 61, 76 in Fig. 5) into a conical hole. Applicants respectfully disagree with the Examiner's contention.

In Brezoczky, the component denoted by reference numeral 49, which forms part of the optical waveguide, corresponds to a suspension arm from which the optical slider 51 is suspended (col. 7, lines 12-13). It is unclear from the statement of rejection how the Examiner proposes to modify Brezoczky's optical head such that the optical waveguide, which includes the suspension arm 49, would extend into a inverted conical or pyramidal hole of the optical head.

Moreover, even if possible to make such modification in Brezoczky, the Examiner has not cited any reference which directly establishes the obviousness of such modification, nor has the Examiner set forth a line of reasoning consistent with and motivated by the cited art establishing that such modifications would have been obvious. See, Symbol Technologies, Inc. v. Opticon, Inc., at 1885.

Claims 122 and 129 include the additional limitation that the optical waveguide is bonded to the second surface of the planar substrate. No corresponding structure is disclosed

or suggested by Brezoczky as set forth above for independent claim 14.

Claim 125 includes the additional limitation that the step of disposing the optical waveguide comprises the step of integrally connecting the optical waveguide directly to the second surface of the planar substrate. No corresponding step is disclosed or suggested by Brezoczky as set forth above for independent claim 127.

In view of the foregoing, applicants respectfully request that the rejection of claims 2-14, 101, 103, 104, 122, 125, 129 and 130 under 35 U.S.C. §103(a) as being unpatentable over Brezoczky be withdrawn.

In view of the foregoing amendments and discussion,
the application is believed to be in allowable form.
Accordingly, favorable reconsideration and allowance of the
claims are most respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: 

Bruce L. Adams
Reg. No. 25,886

17 Battery Place
Suite 1231
New York, NY 10004
(212) 809-3700

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Thomas Tolve

Name



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July 5, 2007

Date